

DATE: February 11, 2008 465-08-01

SUBJECT: Maintenance Manual (Pub 23) & Foreman's Manual (Pub. 113) changes

TO: District Executives

FROM: Richard H. Hogg, P.E.  
Deputy Secretary for Highway Administration

*for W James Smith*

This Strike-Off Letter is being released to align the policies within the Maintenance Manual, Pub 23 and the Foreman's Manual, Pub 113 with the Pavement Policy Manual, Pub 242.

Reference is made to Chapter 7 (Paved Surfaces) of the Maintenance Manual (Pub 23). The following changes have being made;

- Elimination of all references to the 12.5mm Superpave mix design.
- Incorporation of 9.5mm Fine Grade (FG) Superpave mix design.
- Alignment of the minimum and maximum Superpave layer thickness requirements with Pub. 242 (Pavement Policy Manual).
- Change in Bituminous and Concrete Widening Policy to align Chapter with Pub. 242.
- Elimination of all references to Marshall mix designs (ID nomenclature).
- Update of paving restriction dates to be in accordance with Pub 408 Section 409.3(b).

Reference is made to Chapter 5, Foreman's Manual, Pub. 113. Throughout the Chapter the following changes have been made;

- Elimination of the ID nomenclature.
- Update of all the references made to other publications.

These changes affect the following Activities that need to be updated:

- Activity Number 711-7136-01 "Roadway Pavement Widening with B.C.B.C." to align with Pub 242
- Activity Number 711-7125-01 "Road Paved Hot Mix – 1" Mechanized Paver Finisher – Paving"
- Activity Number 711-7131-01 "Road Paved Leveling Course – Hot Mix Mechanized – Tow or Finisher Paver"
- Activity Number 711-7136-01 Roadway Pavement Widening with SuperPave Base Course B.C.B.C.

- Activity Number 711-7137-01 Roadway Pavement Recycled Material

Reference is made to Foreman's Manual, Pub 113. The following activity has been added;

- Activity Number 711-7136-02 "Roadway Pavement Widening with Cement Concrete"

These changes will take effect immediately.

If you have any questions, please contact Dan Dawood, P.E. of my staff at [ddawood@state.pa.us](mailto:ddawood@state.pa.us) or (717)787-4246.

462/JAM/jam

SOL Maintenance Manual (Pub 23) & Foreman's Manual (Pub. 113)

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# **CHAPTER 7**

## **PAVED SURFACES**

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## **7.1 INTRODUCTION**

The maintenance of paved surfaces is one of the most visible activities performed by the Department of Transportation, whether by contract or by Department Forces. The Department is judged by the condition of the highway surface. Therefore, it is important that surface maintenance be performed to a uniformly high standard statewide.

The ideal for surface maintenance is to have all pavements on the state system upgraded to a load carrying capacity and surface condition that would virtually eliminate potholes and depressions and provide a smooth and safe ride.

To accomplish this, it is essential that the service life of the good and fair roads be extended by timely and quality maintenance, i.e., liquid skin patching, seal coating, joint and crack sealing, mechanized patching, concrete patching, drainage repair and cleaning and shoulder cutting.

### **PURPOSE**

The purpose of Chapter 7 is to consolidate and clarify policies and procedures related to the maintenance and preservation of pavement surfaces.

### **OBJECTIVE**

The objective of Chapter 7 is to insure uniform quality maintenance practices statewide for similar pavement problems without losing sight of local conditions.

### **RESPONSIBILITIES**

**Assistant District Executive (Maintenance)** - coordinates the District's compliance with this policy and reviews the planning, scheduling and performance of the work. The Assistant District Executive or representative performs quality assurance checks on Department Force work to verify that work reported is being checked and meets the high quality standards established by this policy.

**District Equipment Manager** - sees that all aspects of equipment maintenance are carried out in accordance with Equipment Managers Manual (Publication 177) and applicable "M" Letters. Repair priorities must be given to pothole patching equipment so that it will be ready by March 1.

**Maintenance Manager** - plans, organizes, schedules and trains personnel for this work. Along with Assistant Maintenance Managers, inspects the work crews and checks the quality of

work accomplished. Takes required managerial action necessary to get the job done properly.

**Assistant Maintenance Manager** - inspects roads and schedules the work, concentrating on high priority roads. They also train Forman and their crews to do the job in accordance with the latest standards. Personally inspects, or causes to be inspected, all routes assigned to him and records any defects that require maintenance on an M-681 (see chapter 3) or other appropriate means to list any corrections needed. The Assistant Manager is responsible to see that the proper combination of men, materials and equipment are scheduled and used to perform all surface repairs. They insure that foreman and crews are doing the work properly. As per Quality Assurance Checklists and the Forman's Manual.

**Field Foreman** - organizes the work force and equipment to execute the work in an efficient and productive manner. Participates in the inspection and collection of roadway condition data and is familiar with the performance and quality standards and carries out the work accordingly. Sees that personnel and equipment are productive at all times. While waiting for materials or other items, secondary activities shall be performed. Reports on general road conditions of routes traveled.

## **7.2 TYPES OF PAVED SURFACES**

### **RIGID PAVEMENTS**

Rigid pavements are those constructed of Portland cement concrete. Concrete is a rigid material that is strong in compression and weak in tension. Concrete pavement acts as a beam when carrying a moving load. The load carrying capacity of a concrete pavement is a function of the strength of the concrete, the strength of the sub-grade and the thickness of the concrete slab.

### **PLAIN CEMENT CONCRETE**

Plain Portland cement concrete pavement is a pavement constructed with Portland cement and aggregates without reinforcing steel. Shrinkage is controlled by the use of short joint spacing, which is normally 15' to 20'. Load transfer joints are used in the transverse joints and tie bars are used in the longitudinal joint.

### **REINFORCED CEMENT CONCRETE PAVEMENT**

Reinforced Portland cement concrete pavement is a pavement constructed with Portland cement, aggregates and reinforcing steel. Reinforcing steel, in the form of welded wire fabric, is used to

control shrinkage cracking and does not add to the structural strength of the pavement. Transverse joint spacing may vary from 15' to 61.5', and may or may not be skewed depending on when the pavements were built. Load transfer units are used in transverse joints and tie bars are used in the longitudinal joints.

### **CONTINUOUSLY REINFORCED CONCRETE PAVEMENT**

Continuously reinforced Portland cement concrete pavement is a pavement constructed with Portland cement, aggregates and a heavy mat of steel reinforcing bars or welded wire fabric. This pavement is constructed without transverse joints except at structures or where it joins another pavement type. Shrinkage cracks are controlled by the heavy steel mat. The slab will develop cracks 2' - 3' apart. Normally these cracks are tight and should not be sealed.

Failures in continuously reinforced pavements should not be repaired by Department Forces without the advice and guidance of the District Pavement Manager.

### **BITUMINOUS SURFACE PAVEMENTS**

Bituminous surface pavements are those where an established base is surfaced with one or more layers of a mixture of graded aggregate and asphalt. The layers can vary in thickness from 1/2" liquid bituminous surface treatment course to a 4.5" binder course.

### **FLEXIBLE BASE PAVEMENT**

A pavement with a bituminous surface on a base other than Portland cement concrete or brick is a flexible base pavement. The structural capacity of a flexible base pavement is a function of the thickness and quality of the base course(s), the thickness and quality of the surface course(s) and the strength of the sub-grade.

### **CENTRAL PLANT-MIXED PAVEMENTS**

Central plant-mixed pavements are those constructed of a mixture of graded aggregate and/or reclaimed asphalt pavement (RAP) that is coated with asphalt (usually hot) in a central plant that may be permanently installed or portable. These mixes are FJ-1, FJ-1C, FB-2 Wearing Course or FB-2 Binder Course and Superpave mixes.

### **TRAVELING PLANT MIX**

Traveling plant-mixes or stabilization plant mixes, are those constructed of a mixture of graded aggregate and/or reclaimed asphalt pavement (RAP) that is coated with asphalt in a

traveling plant and placed directly upon a prepared surface. These mixes are FB-1 Wearing Course, FB-1 Binder Course and cold recycled base courses.

### **SURFACE TREATED / SEAL COATED SURFACES**

A seal coated surface is one where a single application of hot liquid asphalt is applied to a properly prepared surface and covered immediately by a single layer of aggregate. The thickness of the treatment is about the same as the nominal size of the aggregate. A surface treated surface is where two seal coats are placed one on the other. The aggregate size of the top layer is usually smaller than the bottom layer; and may sometimes consist of RAP Materials.

### **RIGID BASE PAVEMENT**

A pavement with a bituminous surface and a Portland cement concrete or brick base is a rigid base pavement. The structural capacity of a rigid base pavement is a function of the concrete thickness and bituminous surface composition and thickness and subgrade support.

### **7.3 RIGID PAVEMENT MAINTENANCE**

The goal of rigid pavement maintenance is to maintain a smooth riding pavement, without an overlay, for as long as possible. This is accomplished by:

- 1) Emphasis on joint sealing, permanent joint spall repair, concrete patching, and pothole and surface spall repair.
- 2) Slab jacking of settled slabs before more serious failures occur.

### **ROUTINE MAINTENANCE**

Routine surface maintenance activities are those which are done primarily by Department Forces to provide preventive maintenance and otherwise maintain the integrity of the pavement until such time as surface improvement is required and programmed. They are activities that are included in the Long Term Plan and scheduled on the Work Order.

### **POTHOLE PATCHING**

This activity includes the preparation and patching of potholes and deteriorated concrete in concrete pavements. The potholes normally occur along cracks and longitudinal or transverse joints, and may extend the full depth of the slab.

Bituminous pothole patching of concrete pavements by Department Force is considered to be temporary patching. The procedure for making these temporary patches is different from permanent patching done on bituminous surfaces. Squaring and cutting of the hole is not required.

Potholes should be thoroughly cleaned. All loose and broken concrete should be removed and the hole blown clean and dried with compressed air.

The clean, dry surface should be tacked with an approved tack coat material in accordance with Section 460.3(b), Publication 408. Tack coat is to be used with hot mix patching materials. Synthetic resin tack material shall only be used on dry surfaces and applied with an approved applicator. After the tack coat has been applied and allowed to cure, the bituminous material is to be placed in lifts not exceeding 5.5" in compacted depth when using 25.0mm Superpave Mix or 4.5" in compacted depth, when using 19 mm or 2" when using 9.5 mm Superpave Mix (in compliance with Pub 242, Table 9.5). The material in each lift should be worked into the corners with the blade of a shovel.

After leveling, each lift should be compacted with an approved mechanical tamper. Care must be taken when placing the last lift to insure that, after compaction, the surface of the patch is 1/8" to 1/4" above the surrounding pavement.

It is not necessary to edge seal bituminous patches in concrete pavement.

### **SURFACE REPAIRS**

Surface repairs are those made to restore the riding surface of the pavement. Primarily, they are repairs of surface spalls, popouts and scaling. Spalls and popouts are surface defects that occur in the slab away from a joint. Generally, they are circular in shape and extend down to the reinforcing steel. Spalls may be temporarily repaired with the standard bituminous patching procedures previously described for pothole patching on rigid pavements. An alternate procedure is the spray patch method, which may be used on Type 3 concrete pavements. A spray patch is made by filling the hole with alternate layers of a liquid bituminous material, such as RS2, CRS2 and Number 8 or Number 9 aggregate. The spalled area should be thoroughly cleaned and dry (the hole may be damp when emulsions are used). Saw cutting is not required. A thin film of bituminous material shall be sprayed on the clean, dry surface. Sufficient Number 8 or Number 9 aggregate is placed in the hole to completely cover the bituminous material. This procedure is continued until the level of material in the hole is slightly above the surrounding pavement. The completed patch shall be compacted with a roller. All foreign material should be removed from the pavement surface around the patch prior to compaction to insure full contact of the roller with the patching material.

Popouts are also surface defects that occur in the slab away from a joint. They occur where the expansion or deterioration of single pieces of coarse aggregate have caused a small pit in the surface.

Popouts are normally too small to be individually repaired. If serious enough to adversely affect the riding quality of the pavement, they may be repaired with a mechanized patch of slurry seal. Scaling, another type of surface defect is the complete loss of the cement mortar matrix that covers the aggregate, leaving a rough textured riding surface. Scaling may involve an area several feet square or the entire slab. Depending upon the severity and scope, a scaled surface can be rehabilitated with a mechanized patch, slurry seal, grinding, or resurfacing. The taper at the end of a mechanized patch or overlay shall conform to Construction Standard RC-28.

### **BLOWUPS**

Blowups are characterized by a tenting effect at a transverse joint caused by expansion of the pavement on either side of the joint. This expansion causes the adjacent pavement slabs to rise off the subgrade and may create an obstruction to traffic. The expansion is caused by high summertime temperatures and usually occurs in pavements where the transverse joints have not been properly maintained and are filled with incompressible material. Blowup repair can be classified as an emergency repair, depending upon the severity of blowup.

Where the blowup is causing an obstruction to traffic the following temporary patching method shall be used. The pavement should be saw-cut transversely on either side of the blowup. All concrete is removed between the saw cuts. Additional saw cuts may be necessary to break the slab into manageable size pieces. The subgrade should be leveled and compacted. Superpave HMA material shall be placed in lifts not to exceed 5.5" in compacted depth. This is considered to be a temporary repair.

Care should be taken not to bind saw blade in cut by back pressure of concrete slab.

A permanent repair in accordance with Construction Standard RC-26 should be scheduled to repair a blowup that is not obstructing traffic or to replace a temporary patch.

### **CRACK AND JOINT SEALING**

This activity includes the cleaning and sealing of random cracks and transverse and longitudinal joints in plain or reinforced Portland cement concrete pavements.

Crack and joint sealing is required to prevent the intrusion of incompressible materials into cracks and/or joints and the infiltration of water into the underlying subbase and/or subgrade. Timely and proper sealing will maintain the integrity of the joints and pavement. It is

anticipated that a properly cleaned and sealed joint will last at least five years.

Joint problems can be divided into several categories: seal failures, transverse joint spalling, and longitudinal joint spalling. Corrective measures include spot joint sealing, joint cleaning and sealing, joint rehabilitation, joint spall repair or joint replacement.

Concrete pavements are divided into three types, based upon the expected service life of the pavement. Joint maintenance will vary according to the type of concrete pavement.

**Type 1** These are pavements that have an expected service life of ten years or more. Joints in these pavements should be rehabilitated. Where not physically possible, sealing methods for Type 2 pavement shall be used.

**Type 2** These are pavements with an expected service life of five to ten years. The best available cleaning and sealing technology should be used on these pavements.

**Type 3** These are pavements with an expected service life of zero to five years and/or are candidates for a surface improvement project. Minimum cleaning and sealing procedures may be used on these pavements.

Type 3 concrete pavements shall be identified by the Maintenance Manager and approved by the District Executive. All other concrete pavements shall be considered Type 1 or Type 2.

Joint sealing shall be done in accordance with Performance Standard 711-7147-01 "JOINT SEALING CONCRETE ROADS".

Joint sealing should only be performed when the pavement temperature is above 40°F and is best performed between 45°F and 55°F. No sealing should be done sooner than 24 hours after any precipitation or if there is moisture in the joint.

Spot sealing will normally require minimal cleaning equipment. Cleaning may be done with hooks and compressed air to remove any loose sealant for spot sealing Type 1 and Type 2 concrete pavements with Type IV (ASTM-D6690) or better on Type 1 pavements and Type I (ASTM-D6690) on Type II pavements. Prepackaged AC with rubber may be used on Type II pavements with district approval. Preferred sealant for Type 3 concrete pavements is AC and rubber or Type I (ASTM-D6690).

When cleaning and sealing is required, the joints should be thoroughly cleaned and dried before sealing. Joints in Types 1 and 2 pavements should be cleaned with either high pressure water

or saw cutting, and/or sandblasting and compressed air. The use of baker rod may be required. It is imperative that the sealant is placed 1/4" below the pavement surface. Type 3 pavements may be cleaned by any method that removes all nonbonded sealant and rubber.

Random cracks should be cleaned and sealed using the same method as the transverse joints.

The longitudinal joint is to be air blown and sealed.

The shoulder joint should be air blown and sealed with any material. The preferred material is prepackaged AC and rubber.

### **JOINT REHABILITATION**

Joint rehabilitation is the creation of an adequate sealant reservoir in a joint and sealing of existing transverse contraction, construction, or expansion joints. Joint rehabilitation may also be required on the longitudinal joint.

This work shall be done in accordance with the latest standard RC-26.

### **JOINT SPALL REPAIR**

Joint spall repair is the repair of spalls adjacent to longitudinal or transverse joints. The condition is characterized by the cracking, breaking or chipping of slab edges adjacent to a longitudinal or transverse joint. It usually does not extend through the thickness of the slab but meets the joint at an angle.

### **JOINT REPLACEMENT**

Joint replacement is the replacement of the entire transverse joint. It is intended to repair crushed joints or joints which have several spalls. Normally, an area of four feet on each side of the existing joint would be removed and replaced.

### **SUBSEALING**

Subsealing is the stabilization of faulted slabs with grout pumped beneath the pavement. It is intended to be used where minor faulting has occurred.

### **SUBSEALING AND SLABJACKING**

Subsealing and slabjacking is correction of minor settlement of the slabs and the filling of voids beneath the pavement. It will also be used to correct isolated faulting of slabs. Subsealing around the raised slab is performed to ensure all voids are filled.

**SUBSEALING, SLABJACKING, AND**

**GRINDING**

Subsealing, slabjacking and grinding is the filling of voids beneath the pavement, the correction of minor settlements and the grinding of the surface to restore the profile on major rehabilitation contracts. Grinding is done after subsealing and slabjacking. It is generally done as a part of a concrete rehabilitation project.

**OVERLAY**

This is resurfacing of an existing pavement to restore the pavement to smooth riding condition. Overlays include both bituminous and concrete. Microsurfacing can be used for texturing purposes.

**FULL-DEPTH CONCRETE PATCHING**

Full-depth Department Force concrete patching should be limited to isolated spot repairs which may potentially present a safety problem to the motoring public and when there is a need to act in a timely manner.

Isolated spot repairs shall be defined as a maximum of 100 square yards per lane mile (approximately 35 cubic yards of concrete).

Requests for exceptions to this policy shall be submitted to the Director of the Bureau of Maintenance and Operations for approval.

**7.4 BITUMINOUS PAVEMENT MAINTENANCE**  
**ROUTINE MAINTENANCE**

Routine surface maintenance activities are those which are done primarily by Department forces to maintain the integrity of the pavement until such time that surface improvement is required and programmed. They are included in the Long Term Plan and are scheduled on the Work Order.

**POTHOLE REPAIR**

The objective of manual pothole repair is to have the County Maintenance Organization plan, schedule and carry out pothole repair work in accordance with Maintenance Performance Standards. The work is to be done correctly with properly staffed and equipped crews to meet this objective.

Pothole repairs are to be completed on a priority basis by the following dates:

1. Interstate highways – April 30
2. Non-interstate NHS highways – prior to Memorial Day weekend
3. Non-NHS highways – June 30

As always, pothole repairs should be made throughout

the year as well, whatever they are observed, reported, sent through the CCC, or phones in through the 1-800-FIXROAD number, all roads are to be checked prior to the start of winter to ensure that there are no potholes going into the winter season.

There should be at least one foreman in each Assistant Maintenance Manager's area that is designated and equipped to quickly respond to complaints of isolated potholes. Priority is to be given to the high traffic roads. This is not to be a "dump and run crew". These crews are to patch according to standard and should be provided with complete and comprehensive work area protection and all required equipment and materials.

All pothole repair equipment should be overhauled and repaired during the winter months and be ready for use as soon as possible, but no later than March 1st of each year. Bids for rented equipment, when required to supplement Department equipment, should be obtained in sufficient time to have it available by March 1st. All Department equipment should be scheduled before utilizing rented equipment.

All bituminous materials shall conform to the applicable requirements of Publication 27, Publication 37 and Publication 408.

Special Bituminous Patching Materials are listed in the Miscellaneous Section of Publication 35, Approved Construction Materials.

Tack Coat material shall be AE-T or synthetic resin.

Manual pothole repair is to be done in accordance with Performance Standard 711-7121-01, "PATCHING - MANUAL", except as noted previously in this section.

The Performance Standard 711-7121-02, "PATCHING - MANUAL, EMERGENCY" pothole repair should be used only for emergency repair during nonstandard, unscheduled work hours, such as call-outs on weekends or holidays or during normal working hours in the periods of extended severe winter weather. All other potholes should be patched in accordance with Performance Standard 711-7121-01, "PATCHING - MANUAL".

Mechanical cutting is not required on roads that are programmed for mechanized patching, leveling and a bituminous surface, a 381 or 383 project or roads that have high density pothole situations where identifying individual potholes is difficult. Such roads must be identified and approved by the District Executive or Assistant District Executive (Maintenance).

Spray patching utilizing specialized equipment which applies the material under pressure is also approved.

Modified patching procedures may be used on pancake or piecrust roads. Those procedures are:

- 1) Remove weak and/or deteriorated material from the edge of the hole with a pick, mattock or other appropriate hand tools.
- 2) Fill with cold mixed material in maximum 6" layers and compact or fill hole to top of base with unbound Number 8 or Number 57 aggregate. Apply a light coat of liquid asphalt followed by alternate layers of aggregate and asphalt until flush or slightly higher than the adjacent surface. Compact the final layer of asphalt and aggregate. Skin patch the patched area and all adjacent surfaces that show signs of distress.

**CRACK SEALING**

This activity includes all actions related to crack sealing bituminous surfaces with prepackaged material in a non over banding operation. Activity includes routing of cracks where required (working transverse and single random cracks), cleaning of cracks, applying material and squeegeeing on rigid or flexible base roads. The objective of this operation is to prevent more serious pavement distress such as base failures or potholes.

Only well defined cracks, 1/2" to 1" in width shall be sealed. Areas that have multiple cracks or cracks less than 1/2" wide should be skin patched. Cracks that vary in width within the prescribed parameters shall be sealed along their entire length. Care must be taken not to overlap, run together or cause a dense amount of sealant to accumulate on the pavement.

Routing is required for transverse cracks and single random cracks when the pavement is less than 5 years old and is not scheduled for resurfacing for a least 2 years. Do not rout areas that contain a significant amount of old sealant material. Create a reservoir for sealant material with the router that has the approximate dimensions of 1/2" wide minimum by 1/2" deep. The pavement layer on which cracks are being sealed must be a minimum of 1 1/2" in depth

It is very important that all cracks be dry. A Hot Compressed Air Lance shall be used to dry all damp cracks. Care must be taken so as to not burn, scorch or damage the pavement.

ONLY prepackaged sealants are accepted for use. The preferred material for roads with multiple cracking situations (with cracks that require routing and cracks that don't require routing) is TYPE I (ASTM D6698. It is also important to heat and apply the sealant being used to the manufacturers specifications both for quality performance and safety concerns. The temperature

limits as listed on the outside of the shipping package shall be adhered to at all times.

All cracks should be uniformly filled and sealed. Cracks shall be sealed by placing the applicator wand in or directly over the crack and carefully placing the sealant to just fill the crack – concave disk applicator heads are no longer used. The sealant shall be wiped off flush with the pavement surface using a squeegee. Only a narrow, thin film of material shall be permitted on the pavement surface. The film shall not be greater than 3" wide and 1/32" thick. Sealant placed in excess of these dimensions shall be removed.

Crack sealing shall be done in accordance with Publication 408 and Performance Standard 711-7128-01, "CRACK SEALING – BITUMINOUS SURFACE, RIGID AND FLEXIBLE BASE."

**SKIN PATCHING**

Skin patching is the application of a layer of liquid bituminous material and a layer of aggregate to seal limited areas of minor cracking, weathering or raveling. It can be done manually or mechanically.

All bituminous materials shall conform to applicable requirements of Publication 37 (Bulletin 25), Specifications for Bituminous Materials.

RS-2	Emulsified Asphalt
CRS-2	Emulsified Asphalt
RS-2PM	Polymer Modified Emulsified Asphalt
CRS-2PME-3M	Polymer Modified Emulsified Asphalt

Skin Patching shall be done in accordance with Performance Standards 711-7127-01, "SKIN PATCH - LIQUID BITUMINOUS, MANUAL" or 711-7127-02, "SKIN PATCH - LIQUID BITUMINOUS MECHANIZED."

All surfaces to be skin patched should be clean of all loose and foreign material. The surface is to be broomed if necessary. Areas to be patched manually should be marked by the foreman.

When using emulsions the air, surface and aggregate temperature should be 60°F or above and rising. No emulsified asphalt shall be applied if rain is expected within 24 hours.

Mechanized skin patching will follow the procedure as described below under "Bituminous Treatments, Liquid Bituminous", including weather limitations.

The use of spray patching equipment to address

alligator cracking and isolated edge deterioration is also recommended.

Manual skin patching may be done in cooler weather if the benefits, assuming aggregate loss, exceed the potential negative impact.

**LIQUID BITUMINOUS TREATMENTS**

A liquid bituminous surface treatment is the sealing of minor cracking, weathering and raveling over large areas with two applications of a layer of liquid bituminous material and a cover layer of aggregate for each bituminous layer. A liquid bituminous seal coat is a single application of liquid bituminous material and aggregate. It should be done before major distress occurs in the pavement. It is the most effective tool for extending the life of rural bituminous pavements.

All bituminous materials shall conform to applicable requirements of Publication 37 (Bulletin 25).

RS-2	Emulsified Asphalt		
CRS-2	Emulsified Asphalt		
RS-2PM	Polymer Modified Asphalt	Emulsified	
CRS-2PM	Polymer Modified Asphalt	Emulsified	

Aggregate Type A stone, slag or gravel meeting the requirements of Section 703.2, Publication 408. 1.0 per cent.

Liquid bituminous treatments shall be done in accordance with Sections 470, "BITUMINOUS SEAL COAT"; 471, "BITUMINOUS SEAL COAT USING PRE-COATED AGGREGATE"; 480, "BITUMINOUS SURFACE TREATMENT" and 481, "BITUMINOUS SURFACE TREATMENT USING PRECOATED AGGREGATE" of Publication 408 and Performance Standard 711-7124-01.

Liquid bituminous treatments should not be used when traffic exceeds 20,000 A.D.T.

The following time restrictions are to be adhered to:

- Roadway: May 1 to September 15
- Shoulders: May 1 to September 15
- District 1-0
- District 2-0
- District 3-0
- District 4-0
- District 5-0 (Carbon, Monroe, and Schuylkill)
- District 8-0 (Mountainous portions of Franklin, Dauphin, Perry)
- District 9-0
- District 10-0

District 11-0

District 12-0

Roadway: May 1 to October 15

Shoulders: May 1 to October 15

District 5-0 (Berks, Lehigh and Northampton)

District 6-0

District 8-0 (Except mountainous portions of Franklin, Dauphin, Perry, and Juniata)

The pavement surface temperature should be 60° F and the air temperature shall be 60° F and rising for one hour before the start of the application of bituminous material.

A design shall be prepared for each route to be treated. The design method in Appendix E of Bulletin 27 or equivalent computer program shall be used. The design is to be on the job at all times.

Prior to the start of any work, the distributor(s), chipper and pneumatic tire rollers must be calibrated. This equipment is to be calibrated in accordance with the procedures outlined in Appendix B of Chapter 7. Also included in Appendix B of Chapter 7 are calibration documents for each of the three pieces of equipment. These may be copied for field use. Copies of the completed calibration documents (either those provided in Appendix B of Chapter 7 or a facsimile) are to be on the job at all times.

The bituminous material shall be applied within the specified temperature limits and at a rate within ±10% of the design rate.

Rolling should be done by sufficient pneumatic tire rollers to cover the entire surface with one pass. Any final rolling should be done with a pneumatic tire roller, as specified in Section 108.05(c)3.f, Publication 408. A ground contact pressure of 40-50 psi is required for all pneumatic tire rollers. All rolling should be done in the direction of traffic.

Vehicular traffic on the newly completed surface should be restricted until adequate stability and adhesion have been obtained and the material is sufficiently cured to prevent distortion, flushing of bituminous materials to surface or loss of aggregate. Traffic should be controlled by the use of a pilot vehicle and flaggers or a detour.

When a liquid bituminous treatment is placed on an old hot plant mix pavement, the road should be closed to traffic until complete curing is obtained unless a pilot car is used to control traffic. This work is restricted to the months of June, July and August. Programmed liquid bituminous

surface treatment projects are to be programmed on the Notification screen.

For additional information, refer to Performance Standard 711-7124-01, "LIQUID BITUMINOUS TREATMENT - MECHANIZED" and related quality assurance indicators.

A report should be completed daily by the project foreman using the format in Chapter 7, Appendix D and kept on file in the county office.

### POST-CONSTRUCTION CONDITIONS

Flushing or bleeding of seal coats and surface treatments is a problem that can occur following the completion of this work. Extremely hot weather and the use of these treatments on high ADT roads contribute greatly to flushing or bleeding conditions.

Flushing or bleeding on this type of surfacing can occur due to one of the following causes.

**Loss of Cover Aggregate** - If there is a substantial loss of cover aggregate from a seal coat or surface treatment, the underlying bituminous material is exposed and presents a flushed surface. The loss of cover aggregate can result from (a) inadequate application rate of bituminous material, (b) inadequate traffic control before the bituminous material cures, (c) use of dusty aggregates, (d) use of excessively damp aggregate (e) in case of surface treatment, excessive application of Number 67 aggregate, (f) incompatibility of stone and bitumen.

**Excessive Bituminous Material** - If it is established that there is no significant loss of cover aggregate, then the cause of flushing is usually excessive application rate of the bituminous material and embedment of the cover aggregate. The excessive application rate can result from (a) not following the design application rate in the field, (b) improper evaluation of existing surface condition or (c) improperly calibrated application equipment. The design application rate can also prove to be excessive if the cover aggregate is thin and elongated and not nearly cubical in shape.

### REMEDIAL MEASURES

It is very difficult to correct the flushed condition of a seal coat, surface treatment or shoulder overspray. Several measures can be attempted to improve the existing flushed condition. Since the flushing can range from marginal (just a smear on the aggregate) to truly excessive (significant amount of bitumen which can be scrapped off the aggregate of the old surface), these measures should be attempted on a trial basis only after an engineering judgment of the situation has been made. The following

remedial measures are listed in the order of increasing potential for success.

1. Apply clean dry coarse sand (for marginal flushing) or dry Number 8 aggregate (for excessive flushing) on a hot day and roll it immediately.
2. Apply heated coarse sand or heated Number 8 aggregate on a hot day and roll it immediately.
3. Apply pre-coated Number 8 aggregate at ambient temperature on a hot day and roll it immediately. Pre-coating with PG 64-22 is preferred.
4. Apply heated pre-coated Number 8 aggregate (preferably using PG 64-22) on a hot day and roll it immediately. The temperature range for aggregate pre-coated with PG 64-22 should be in the 300°F - 350° F range.  
**NOTE:** The chances of success in aggregate retention will be enhanced if a clean 1/4" size aggregate is used in lieu of Number 8 aggregate in remedial measures through 4.
5. Use open graded bituminous mixtures, such as, FB-1, FB-2 or FB-Modified as an overlay over the flushed pavement.

It should be noted that treatments 1 through 4 will have a better chance of success if the work is done in hot weather as soon as possible. To further increase the chance of success, a three wheel steel roller, as specified in Section 108.05(c)3.a. of Publication 408. A minimum of three (3) passes will give optimum results.

Seal coats and surface treatments over newly constructed FB surfaces may encounter the following problems:

**Excessive Aggregate Whip-off** - A newly constructed FB course is usually open and porous. A substantial amount of the bituminous material is, therefore, absorbed by the FB surface, leaving an insufficient amount to retain the cover aggregate. This results in aggregate whip-off loss just after construction. Pipe trench restoration and base repair locations that were finished to grade with 19 mm or 25 mm superpave should be scheduled for skin patching in advance of liquid bituminous seal coat operations.

**Flushing or Bleeding in Wheel Tracks** - Since newly constructed FB surfaces have not been densified by traffic, it is possible that Number 8 cover aggregate gets partially embedded in the FB surface under traffic. This reduces the protruding thickness of aggregate and the initial application rate of bituminous material proves to be excessive later on, causing flushing especially in wheel paths.

**MAINTENANCE PAVING**

Paving is the application of hot bituminous plant mix material in a uniform lift of approximately 1" to 1 1/2" in compacted depth over the full roadway width and placed on a prepared surface over extended lengths of roadway in excess of 500 feet. The intent of paving is to be a finished wearing course and additional surface applications are not normally anticipated in the immediate future.

Department force or contract work in this activity is limited to applying FJ-1 or FJ-1C to a compacted depth of 1"; or 9.5 mm FG Superpave mixes applied to a compacted depth of 1"; or 9.5 mm Superpave mix applied to a compacted depth of 1 1/2".

Application rates of 90 to 120 lbs. per square yard using 9.5 mm FG shall be restricted to roadways with an Average Daily Traffic (ADT) volume of 5,000 or less. 1 1/2" paving projects on roadways with an ADT greater than 15,000 require project submission to and advance approval of the District Executive.

Cool or cold weather will adversely affect the performance of 1" paving; hence, the ambient temperature must be 40 degrees F and rising and the work shall be restricted to the time period of April 1 through October 31 according with Pub 408 Section 409.3(b).

To achieve adequate density rolling patterns must be established and compaction must begin as soon as possible after placement of the hot mix and be completed before the mat cools to 175° F. Density testing should be ongoing as the operation progresses to ensure that rolling patterns are sufficient.

FJ-1 and FJ-1C material is restricted to high type bituminous surfaces, with speed restrictions of 40 MPH or less in primarily urban type areas. This work is to be accomplished in accordance with Section 422 of Specification 408. 9.5 mm superpave material is used on type 40 or type 60 roadways and is applied in accordance with Section 409 of Publication 408.

Prior to the application of hot bituminous plant mix wearing courses, all surface defects must be carefully studied and repaired. Roadway preparation work such as pothole patching, skin patching, sealing cracks in excess of 1/4", base failure repairs, etc. shall be completed and charged to the appropriate activity code. Particular attention should be given to removing wheel path ruts of 1/2" or greater with a leveling course.

Notches are required to be cut at the limits of the project and intersecting roads per the Maintenance Manual, Chapter 7 and a tack coat applied for all applications in accordance with Section 460 of Publication 408.

This work shall be scheduled on the M-213 program.

Temporary pavement markings may be required per Section 203.72 of Publication 203, Work Zone Traffic Control.

**TRAVELING BITUMINOUS PLANT MIX (MIXER PAVER)**

This activity is the placement of a traveling plant mixed bituminous material having a compacted depth of 1" (approximately 110 pounds per square yard) for FB-1 Wearing Course and having a compacted depth of 2" (approximately 220 pounds per square yard) for FB-1 Binder Course.

All bituminous materials shall conform to the requirements of Publication 37.

PG64-22	Asphalt Cement
PG58-28	Asphalt Cement
PG52-28	Asphalt Cement
PG-46-40	Asphalt Cement
MS-2	Emulsified Asphalt
CMS-2	Emulsified Asphalt
SS-1	Emulsified Asphalt
HFMS-2h	Emulsified Asphalt

Aggregate shall meet the requirements for Type A aggregate or better, Section 703.2, Publication 408.

This activity shall be done in accordance with Section 439, "BITUMINOUS WEARING COURSE FB-1", and Section 440, "BITUMINOUS BINDER COURSE FB-1" of Publication 408.

While the FB-1 surface is still tacky and before opening to traffic it is mandatory to spread fine aggregate at the rate of 3-5 lbs : per square yard, roll and then sweep remaining loose fine aggregate.

The use of FB-1 Wearing Course or Binder Course is restricted to flexible or rigid base roads carrying light to medium traffic (1,500 ADT).

It is recommended that FB surfaces be subjected to three months of warm weather densification before the application of a surface treatment or seal coat. The surface treatment or seal coat should be applied within one year.

Programmed traveling bituminous plant mix projects shall be documented on the Notification screen.

For additional information refer to Performance Standard 711-7123-01 "BITUMINOUS SURFACE-MIXER PAVER".

**MICRO-SURFACING**

Micro-surfacing is a thin surface paving system composed of polymer-modified emulsion, crushed aggregate, mineral filler, water and field control additives as needed. Micro-surfacing can be utilized for preventive maintenance and surface rehabilitation on both low and high ADT pavements. Its uses include

texturing, sealing and rut filling.

### **RALUMAC**

Ralumac is a high-tech oil and chip using a combination of aggregate, Portland cement, water and a latex modified emulsion.

### **NOVACHIP**

Novachip is a paver placed seal/wearing course of open-graded, plant mixed, bituminous concrete placed on a polymer modified asphalt emulsion tack/seal coat.

### **ULTRA-THIN WHITETOPPING**

Ultra-Thin Whitetopping (UTW) is a process where a thin layer of concrete (2-4 in.), usually high strength and fiber reinforced, is placed over a prepared surface of distressed asphalt. The UTW utilizes short joint spacing and bonds to the underlying asphalt surface. The underlying asphalt surface should be a minimum of 3 inches thick after preparation.

UTW provides a durable wearing surface for a variety of applications which include low volume roads, intersections and ramps where rutting and washboarding is a problem. UTW can be placed and opened to traffic within 24 hours by using an accelerated concrete mix.

### **MECHANIZED PATCHING**

Mechanized patching is intended to repair small areas of severe weathering or raveling, block cracking and multiple shallow potholed areas. This work shall be done in accordance with Publication 408 Sections 401 and 409. Super pave material thicknesses shall comply with Publication 242, Table 9.5.

All mechanized patching projects shall be documented on the notification screen as well as the M-213 Program and be reviewed and approved by the District Office.

Time restrictions for mechanized patching shall conform to Section 401.3(b), Publication 408.

If the nominal depth of wheel ruts is greater than 1/2" and not flushed, the pavement should be tack coated and a thoroughly compacted leveling course applied to fill the ruts and level the surrounding pavement, as needed.

Any full width mechanical patch located on a curve or within breaking distance of an intersection as well as all full width patches longer than 50' must meet the current SRL requirements.

Mechanized patches should have a minimum thickness of 1" for FJ-1, FJ-1C, FB-1 Wearing Course and FB-2 Wearing Course; 1" for 9.5 mm FG

Superpave; and 1 1/2" for 9.5 mm Superpave; 2.5" for 19 mm Superpave, FB-1 Binder Course and FB-2 Binder Course.

A paving notch is to be used at each end of a full width patch of 1" or greater depth.

A tack coat in accordance with Section 460, Publication 408 is to be used on all Superpave material and FJ mechanized patching projects.

Temporary pavement markings should be installed as required by Section 203-72 of Publication 203, Work Zone Traffic Control.

For additional information refer to Performance Standards 711-7122-01, "PATCHING HOT PLANT MIX TOW PAVER-MECHANIZED" or 711-7122-02, "PATCHING MIXER PAVER MECHANIZED" or 711-7122-03, "PATCHING-PAVER FINISHER MECHANIZED" and 711-7122-04 "MECHANIZED EDGE PATCHING"

### **BASE REPAIR**

Base repair is intended to repair large severely fatigue cracked, potholed or distorted pavement sections and restore the structural integrity of the pavement.

Base repair shall be done in accordance with Section 305, Publication 408 and Performance Standards 711-7126-01, "BASE/SUB-BASE REPAIR FLEXIBLE BASE-LIGHT DUTY" 711-7126-02, "BASE/SUB-BASE REPAIR FLEXIBLE BASE- HEAVY DUTY" or 711-7126-03, "BASE/SUB-BASE REPAIR RIGID BASE" OR 711-7216-04 "BASE/SUB-BASE REPAIR MECHANIZED (WIDENER).

Base repair may be done

### **LEVELING**

Leveling is the application of bituminous material over extended lengths of roadway to correct surface distortions such as irregular cross section or wheel path rutting. Leveling courses are normally followed by additional surface applications of bituminous material; either a seal coat (oil and chipping) or 1" paving (FJ), or 1 1/2" overlays (with 9.5 mm Superpave Mix) in the same or subsequent construction season.

All applications of 9.5mm ~~12.5mm~~ Superpave Mix or FB-1 and FB-2 binder course material in excess of 500 feet in continuous length shall be charged to leveling. Application of short sections of 9.5mm Superpave Mix or FB-1 and FB- 2 less than 500 in length shall be charged to Mechanized Patching 711-7122. Application of FB-1 or FB-2 Wearing Course in a uniform 1" lift (90-110 lbs. per square yard) shall be charged to Activity 711-7123. The application of FJ, 9.5mm Superpave Mix or 9.5 mm FG placed to repair surface defects such as distorted cross section or wheel

path ruts prior to the application of a 90 to 120 lbs. per square yard uniform lift of paving (711-7125) or the application of 180 lbs. per square yard uniform lift of paving (711-7135) shall be charged to Leveling (711-7131). Leveling projects shall be planned and approved by the District Executive on the organization's M-213 program.

Temporary pavement markings may be required per Section 203.72 of Publication 203, Work Zone Traffic Control.

The following types of material may be used for leveling.

1. **FJ** - The use of an FJ leveling course is restricted to high type bituminous surfaces to remove surface distortions and wheel path ruts of 1/2" or less and is intended to prepare a roadway for the application of a uniform 1" lift of FJ, a 1 1/2" lift of 9.5mm Superpave Mix wearing course. The application of the FJ leveling course is to be a separate and distinct operation and placed in a similar manner to a wearing course including proper tacking per Section 460 and compacting per Section 401.3(h) of Publication 408. The depth of the Leveling Course will vary according to field conditions but generally will be applied at the rate of 60-90 lbs. per square yard or less averaged over the length of the project. The application of the wearing course should follow immediately after completion of the Leveling Course.

#### 2. **9.5mm Fine-Graded Superpave Mix**

This material is normally used on type 40 or type 60 roads to remove surface distortions or wheel path ruts 1/2" or greater and is intended to prepare a

roadway for the application of a uniform 1" lift of 9.5 mm Fine Graded Superpave Mix or a 1 1/2" lift of 9.5mm Superpave Mix.

The application of the 9.5mm Superpave Mix Leveling Course is to be a separate and distinct operation and placed in a similar manner to a wearing course including proper tacking per Section 460 and compacting per Section 401.3(h) of Publication 408.

The depth of the 9.5mm Fine-Graded Superpave Mix Leveling Course will vary according to field conditions, but should be applied at a minimum rate of 60-90 lbs. per square yard averaged over the length of the project. Reference Publication 242, Table 9.5 for Superpave material thickness requirements. The application of the 9.5mm Superpave Mix

wearing course should follow immediately after completion of the Leveling Course.

3. **FB-1 or FB-2 Wearing Course** – This material is normally used on Type 30 roads with an ADT volume of 1500 or less and light truck traffic. It is normally applied at a rate of 60 to 90 pounds per square yard. Application of uniform 1" lift (90-110 lbs. per square yard) shall be charged to assembly 711-7123.

An FB-modified material can also be used. This material is similar to FB-2 but includes a latex additive. The material is applied in accordance with Section 430 or Section 439, Bituminous Wearing Course of Publication 408. A tack coat is not required. Compaction is to be accomplished with a tandem and 3 wheel roller. Intermediate rolling with pneumatic tire roller is not required. After initial compaction, apply 3-5 lbs. per square yard of fine aggregate, sweep and finish rolling. Surface conditions will determine if a seal coat is required during the same or succeeding construction season.

**4. FB-1 or FB-2 Binder Course** – This material is normally used on Type 30 roads with an ADT volume of 1500 or less and moderate truck traffic. It is applied at a rate of 160 or 220 lbs per square yard. The material is applied in accordance with Section 431, or Section 440 Bituminous Binder Course of Publication 408. A tack coat is not required. Compaction is to be accomplished with a tandem and 3 wheel roller. Intermediate rolling with pneumatic tire roller is not required.

Surface conditions will determine if a seal coat is required during the same or succeeding construction season.

#### **JOINT REPAIR**

Joint repair is the correction of tented joints and blowups on bituminous overlaid concrete pavement. The entire depth of pavement structure is removed and replaced with bituminous concrete.

Joint repair shall be done in accordance with Performance Standard 711-7126-03, "BASE/SUB-BASE REPAIR-RIGID BASE".

For additional information refer to Section 305, Publication 408 and Performance Standard 711 7126-02, "BASE/SUB-BASE REPAIR FLEXIBLE BASE-HEAVY DUTY".

#### **MILLING, LEVELING AND BITUMINOUS SURFACE TREATMENT**

This is the improvement of seriously distressed [rural] pavements by milling selected areas of the

irregular surface, restoration of the profile, as needed, with a leveling course and sealing the surface. It is intended to be used on a large portion of the rural system. The amount of milling will vary depending on the type of distress identified. Distressed areas of widening and heavily cracked areas will be milled and replaced with binder prior to the leveling and surfacing. This is particularly suited to bituminous overlaid concrete pavement.

This work shall be done in accordance with Pub 408 Section 409 and applicable Special Provisions and Publication 242, Table 9.5 for Superpave material thickness requirements.

## WIDENING

This activity is the widening of roadways with deficient pavement width. The width criteria in the Maintenance Manual, Chapter 7, Appendix A, should be used to determine the minimum desirable width.

Work may be accomplished by Department Forces or Contract. Department Force projects shall be confined to Maintenance Functional Class (MFC) C, D and E system. Projects shall be approved in advance by the Assistant District Executive for Maintenance and scheduled on the M-213 program.

If both sides of the roadway are to be widened, it shall consist of a minimum of 2 feet on each side. Partial lane widening (< 10 ft) shall match pavement type and depth.

Full lane additions ( $\geq 10$  ft) shall match existing pavement type and depth unless circumstances dictate heavier traffic loadings for the additional lane; then design for actual traffic. When changing pavement layer thicknesses, check that drainage is adequately provided throughout the pavement cross-section.

## CEMENT CONCRETE PAVEMENTS

If the existing pavement has a surface or base consisting of cement concrete pavement, widening or lane additions shall be in accordance with Pub 242 Chapter 4.8 and the following, unless waiver is granted by the Pavement Design and Analysis Section:

1. Bituminous material may be used, without waiver request, if the cement concrete pavement:

- was not constructed since 1945, or
- has non-uniform depth, or
- has depth less than 9 in., or
- carries no more 40 trucks per day

2. Class AA cement concrete shall be used.

3. Widening of plain cement concrete pavement shall be

constructed with plain cement concrete. Reinforced concrete pavement may be widened with either reinforced or plain cement concrete.

4. Lane additions and widening shall be tied to the existing pavement.

5. If the future traffic pattern supports the flow of traffic diagonally crossing the longitudinal joints, consider removal and replacement of slabs involved.

6. Transverse joints spacing for the widening or lane addition are as follows:

- Plain Concrete < 10 in. thick - 15 ft. joint spacing
- Plain Concrete > 10 in. thick - 20 ft. joint spacing
- Reinforced Concrete - 30 ft. joint spacing

Transverse joints on the widening or lane addition shall be aligned with those on the existing pavement, and intermittently as needed to most closely match these defined spacing.

7. This work shall be charged to either assembly 711-7136-02 (Pavement Widening Cement Concrete).

## BITUMINOUS PAVEMENTS

If the existing pavement consists of full-depth bituminous material, widening or lane additions shall be in accordance with Pub 242 Chapter 5.9 and as follows.

1. Either Recycled Asphalt Pavement (RAP) or 25mm Superpave Mix may be used for widening. Aggregate Bituminous Base Course (ABBC) may be used in lieu of RAP with approval of the District Executive.

2. If recycled material is used, the depth of the widened pavement shall match the existing pavement depth or be a minimum of 6 inches, whichever is less. The widened area shall be sealed during the same construction season.

3. The depth of the widened pavement when using Superpave shall match the depth of the existing pavement using the following criteria or a combination of Table 9.5 of Pub 242.

4. The work shall be done in accordance with Sections 210, "SUBGRADE"; Section 305, "BITUMINOUS CONCRETE BASE COURSE"; Section 341, "COLD RECYCLED BITUMINOUS BASE COURSE"; Section 409, "PLANT-MIXED BITUMINOUS CONCRETE COURSES"; and Section 320, "AGGREGATE BITUMINOUS BASE COURSE" of Publication 408 and applicable special provisions.

5. This work shall be charged to either assembly 711-7136 (Pavement Widening with Superpave Base

Course) or 711-7137 (Pavement Widening Recycled Material).

### **MILLING, RECYCLING, LEVELING AND RESURFACING**

This is the restoration of the cross section of a severely distressed pavement by milling and the recycling of the milled material into the pavement and/or shoulder reconstruction. It also provides a uniform surface to begin resurfacing and reduces the thickness of shoulder reconstruction. These projects would be used where the ADT exceeds 2000 and in urban areas.

### **RECONSTRUCTION**

This activity is the complete reconstruction of a section of road done to upgrade the structural capacity or to improve safety.

### **TACK COAT**

A tack coat is a very light spray application of bonding material applied to the road surface prior to placement of hot plant mix bituminous material. The purpose of a tack coat is to ensure adhesion between the existing surface and the new course being applied.

A tack coat is to be applied prior to placement of all leveling courses, wearing courses, mechanized patches or pothole repairs when using the following hot plant mix bituminous materials: FJ-1, FJ-1C, 9.5mm

Superpave Mix, or 19 mm Super Pave Mix. The exception to applying a tack coat when using the above materials is when a wearing course is placed immediately (within a few days) over a freshly laid, clean and dry leveling course.

A light tack coat should also be applied to flushed areas unless the entire or nearly entire roadway is flushed and at the time of application of the bituminous course the flushed surface is sticky to the touch. The decision not to use a tack coat per Section 409.3(g) of Publication 408 requires the approval of the Assistant District Executive for Maintenance.

A tack coat is not required when placing the following: FB-1, FB-2 or cold mix.

The most common emulsified asphalt material used for tack coat is AET in accordance with Section 460.2(a) of Publication 408. Per Bulletin 25 (Publication 37) Specifications for Bituminous Materials, this emulsion may have either negative (anionic) or positive (cationic) particle charge and the purchasing organization should specify when ordering.

Stone/oil compatibility tests are not required when selecting a tack coat. However, the tack coat should be of the same charge as emulsions previously used through a distributor or other application equipment to reduce the possibility of sludge build-up; i.e.,

Emulsified tack coat is applied to the road surface at a rate of approximately 0.05 to 0.15 gallons per square yard leaving the desired asphalt residue after a set of 0.02 to 0.07 gallons per square yard.

The application of the emulsified tack coat to the road surface is to be accomplished in accordance with Section 460 of Publication 408.

During construction of the longitudinal joint, paint the vertical face of the previously placed lane with a very thin coating of emulsified asphalt tack coat material (AET) prior to placing the abutting lane.

Synthetic Resin Tack Coat (SRTC) is approved solely for use as a pothole tack coat. SRTC contains approximately 50% mineral spirits which can have a flash point as low as 100°F. Suitable safety precautions are mandatory at all times when handling this material. Open flames or sparks must not be permitted close to this material and a non-pressurized backpack sprayer is used to apply this material.

SRTC also releases undesirable Volatile Organic Compound (VOC) emissions into the atmosphere which adversely affect air quality, and therefore the use of this material is to be restricted to pothole patching when other suitable tack coat material are not available. Air quality is monitored by and is under the regulation of the Environmental Protection Agency (EPA).

### **PAVING NOTCH**

The purpose of a paving notch is to provide a smooth transition between the existing pavement and the new course being placed and also to prevent raveling which is common with a feathered edge.

Paving notches shall be constructed at the beginning and end points of the paving and at intersecting roads when placing hot plant bituminous mix material at a depth of 1 inch or greater. This applies to Paving (711-7125) and Mechanized Patching (711-7122) operations.

Paving notches are to be constructed in accordance with Section 409 of Publication 408. A notch is normally not required when applying a leveling course, which is to be followed by a wearing course. The leveling course may be feathered in accordance with Roadway Construction Standard RC-28.

Ideally paving notches should be constructed using a grinding machine making a cut in a triangular shape in accordance with the standard drawing, Appendix G. Rectangular shaped notches may be constructed when using a pavement breaker to cut the

notches.

The depth of the notch should be a minimum of 1" or the depth of the wearing course being applied if greater than 1". A notch that is over cut depth wise should be repaired by placing a layer of hot plant bituminous mix material in the over cut notch and compacting to the desired triangular shape.

The minimum width of the notch is two feet for the main line and one foot for intersecting cross streets.

A notch is not required on "pie crust" roads, concrete roads, at the intersection of driveways or when using FB material.

A tack coat is always applied to the surface including vertical face of the notch prior to placement of the bituminous material. After compaction, a 4-inch band of approved crack sealing material is lapped over the junction of the existing and new wearing course to seal the joint.

**7.5 APPENDICES**

**APPENDIX A  
CHART 1  
MINIMUM WIDTH CRITERIA FOR MAINTENANCE PROJECTS ‡**

CURRENT TRAFFIC ADT	PAVEMENT		SHOULDERS * (EACH SIDE) MINIMUM
	DESIRABLE		
0 To 400**	20' - 0"	18' - 0"	2' - 0" Minimum
401 To 1,000	20' - 0"	18' - 0"	2' - 0" Minimum
1,001 To 2,000	22' - 0"	20' - 0"	2' - 0" Minimum
2,001 To 4,000 10% Heavy Vehicles***	22' - 0"	20' - 0"	3' - 0" Minimum
4,001 To 10,000 10% Heavy Vehicles***	22' - 0"	20' - 0"	3' - 0" Minimum
10,001 To 20,000	24' - 0"†	22' - 0"	4' - 0" Minimum
Over 20,000	24' - 0"†	24' - 0"†	5' - 0" Minimum

‡ THE MINIMUM WIDTH CRITERIA FOR BRIDGES SHALL CONFORM TO THE REQUIREMENTS IN DESIGN MANUAL, PART 2, CHAPTER 1.

\* THE MINIMUM SHOULDER WIDTHS MAY BE WAIVED, AS REQUIRED, TO REMAIN WITHIN THE LIMITS OF EXISTING RIGHT-OF-WAY WIDTHS.

\*\* IN UNIQUE CIRCUMSTANCES, AN EXCEPTION MAY BE APPROVED BY THE DE

\*\*\* OVER 10% HEAVY VEHICLES, PAVEMENT WIDTH IS 22' - 0" MINIMUM TO 24' - 0" DESIRABLE. EVERY EFFORT SHOULD BE MADE TO ACHIEVE 24' - 0" PAVEMENT WIDTHS WITHIN EXISTING RIGHT-OF-WAY. THE NUMBER OF HEAVY VEHICLES = CURRENT TRAFFIC ADT x % OF TRUCKS, BUSES AND RECREATIONAL VEHICLES.

† UNDER RESTRICTIVE OR SPECIAL CONDITIONS, SUCH AS RIGHT-OF WAY OR LATERAL CLEARANCE LIMITATIONS, REDUCTION OF PAVEMENT WIDTH FROM 24' - 0" TO 22' - 0" IS ACCEPTABLE.

**APPENDIX B**  
**RUBBER TIRE ROLLER CALIBRATION DOCUMENT**

County: \_\_\_\_\_

Performed: \_\_\_\_\_

Date: \_\_\_\_\_

Equipment #: \_\_\_\_\_

(A) Tire Ply \_\_\_\_\_ { \_\_\_\_\_

(B) Weight of Roller \_\_\_\_\_  
(Unballasted)

(C) Number of Wheels \_\_\_\_\_

(D) Wheel Load [(B) (C)] \_\_\_\_\_

(E) Required Tire Pressure \_\_\_\_\_ { \_\_\_\_\_

1. Determine tire ply. If all the same, only one entry is required. . .if multiple plies exist, identify and record location of each.
2. Determine and record weight of roller without ballast.
3. Determine and record the number of wheels.
4. Calculate and record the wheel load in pounds by dividing the weight of the roller without ballast by the number of wheels.
5. Based on tire ply and calculated wheel load weight, use the manufacturer's calibration chart located on the roller to determine and record the required tire pressure to achieve a ground contact pressure of 40-50 pounds for seal coat & liquid bituminous surface treatment or 60-95 pounds for hot plant mixed bituminous paving. See Appendix B, page 7-20, for an example of a calibration chart.
6. Inflate all tires to the required pressure.
7. Conduct the Dry Print Tracking Test procedure outlined on Page 7-19, Appendix B. If adjustments to tire pressure are necessary to get complete coverage, record the adjusted tire pressure here.  
[This item not required when roller is calibrated for paving.]
8. A copy of this calibration shall be on the job at all times. This procedure is to be completed annually prior to the commencement of the seal coat and surface treatment program

## **RUBBER TIRE ROLLER CALIBRATION**

### **"Dry Print Tracking Test"**

This test is designed to aid in the determination

of adjustments required, if any, to individual tire air pressure or other components of the rubber tire roller to ensure single pass total area coverage. This test is to be conducted after inflating all tires to the required tire pressure as outlined in Steps (A) through (E) of Chapter 7, Appendix B, pages 7-18.

To begin the test you will need a tire pressure gauge, an air supply source, computer paper and a relatively clean, flat, dry surface sufficient in length to allow straight tracking of the tires.

Ten to twenty feet in front of the roller, position

computer print paper or a facsimile, perpendicular to the path of the roller. The paper should be placed flat on the surface and be of sufficient length to extend beyond the width of the roller right and left. The paper must be held in a fixed position during the test by either taping or

weighting each end, the application of weights is recommended.

Slowly move the roller forward in a straight line over the test paper. Dust and ground-in dirt on the tires will leave a print on the paper reflecting the actual contact area of each tire.

After having passed over the test paper, review the results. The total area over the width of the roller should be covered, with no streaking or uncontacted areas. If streaking is evident, adjustments must be made to achieve total surface area coverage. Although minor adjustments to individual tire air pressure may result in total coverage, these adjustments should not be made before the following items are reviewed:

**TIRE CONDITION** - Are tires abnormally worn or damaged? Adjusting tire pressure to compensate for exaggerated wear or damage may result in drastically altering the specified ground contact pressure, replacement should be considered.

**TIRE PLY** - Recheck tire ply rating. If tires of different ply ratings are present, were these differences addressed in the calibration of required tire air pressure? If not, required tire pressure will have to be recalibrated, and

adjusted accordingly.

**BALLAST** - The roller should be "un-ballasted". If ballast is present it should be removed. The presence of ballast will affect ground contact pressure and unevenly distributed ballast will adversely affect the tracking quality of the roller.

**- RIMS** - Are the rims all of the same type? During the course of operations, tire replacement has, on occasion, resulted in interchanging different rim types between rollers. Although interchangeable, a mix of "flat" and "dish" type rims will result in incomplete coverage because of the difference in offset from one to the next (as much as 1 1/4"). Attempts to compensate for this condition by lowering air pressure will not be possible.

At this point, if adjustments have been made to

any of these components, rerun the Dry Print Tracking Test and evaluate the results. If streaking or uncontacted areas remain, reduce the air pressure in increments of three pounds on all tires, rerunning and evaluating the Dry Print Tracking Test after each reduction in air pressure. When complete coverage is attained, record the adjusted tire air pressure in the boxes provided in Item #7, Appendix B, pages 7-18.

\*\*\* Reducing the air pressure below the manufacturer's recommended minimum will adversely effect the lateral stability of the roller. Consult the equipment manufacturer if it becomes apparent that tire pressure will have to be reduced to less than 25psi to achieve full width tracking coverage.

<b>RUBBER TIRE ROLLER CALIBRATION CHART</b>															
<b>MAXIMUM GROUND CONTACT PRESSURE</b>															
<b>(For 7.50 X 15 Smooth Tread Compactor Tires)</b>															
TIRE PLY		12 PLY						14 PLY							
TIRE PRESSURE		35	50	60	70	90	110	35	50	60	70	90	110	120	130
WHEEL LOAD		GROUND CONTACT PRESSURE AND CONTACT AREAS													
1000	GCP	38	44	47	51	60	65	46	50	54	56	61	68	71	74
	CA	26	23	20	20	17	15	22	20	19	18	16	15	14	14
2000	GCP	46	53	56	60	69	75	54	59	62	65	72	78	82	86
	CA	43	38	36	33	29	27	37	34	32	31	28	26	24	23
2500	GCP	50	57	60	65	74	78	57	63	66	70	76	83	87	90
	CA	50	44	42	38	34	32	44	40	38	36	33	30	29	28
3000	GCP	53	60	64	69	77	83	60	66	70	73	80	87	91	94
	CA	57	50	47	43	39	36	50	45	43	41	38	34	33	32
3500	GCP		64	67	71	81	86		68	73	76	83	90	94	98
	CA		55	52	49	43	41		51	48	46	42	39	37	36
4000	GCP			70	75	84	89			75	79	86	94	98	101
	CA			57	53	48	45			53	51	47	43	41	40

GCP - GROUND CONTACT PRESSURE  
 CA - GROUND CONTACT AREA  
 PUB. 408. SPECIFIED  
 \*SEAL COAT/LIQUID BITUMINOUS SURFACE TREATMENT - 40 TO 50 LBS

GROUND CONTACT PRESSURE  
 \*HOT PLANT MIXED BITUMINOUS PAVING - 60 TO 95 LBS

## OIL DISTRIBUTOR AND CHIPPER CALIBRATION PROCEDURE

### OIL DISTRIBUTOR

Distributor calibration consists of verifying the accuracy of three elements. These elements are:

1) The asphalt pump tachometer or gallons per minute meter; 2) The bitumeter or foot per minute meter and 3) Triple lap coverage or correct fan width of material applied. The calibration document, located in Appendix B, page 7-24, is segmented to address each of these elements and may be copied for field use.

Before beginning the calibration process, all screens or in-line strainers should be checked and cleaned, all spray nozzles should be of the type appropriate for the material being applied and each must be adjusted to the required angle using the wrench provided for this purpose. The fifth wheel must be free of buildup, secure in its yoke and free riding on the surface. Additionally, in preparation to test fan width for triple lap coverage, all nozzles should be plugged such that only every third nozzle is firing . . . all nozzles on the last three feet of the bar should remain open for pressure relief.

### DISTRIBUTOR CALIBRATION/DOCUMENTATION

#### Gallons Per Minute Test

##### PRE-TEST INFORMATION AND WARMUP

- Record the type and temperature of oil to be used during the calibration. The oil should be within the application temperature range as it appears on the bill of lading.
- Position the empty distributor on a relatively smooth, level surface near the source of supply and pump approximately 200 gallons into the distributor to warm the pump.
- Record the quantity in the distributor as indicated by use of the calibrated measuring stick and as indicated by the tank gauge.
- Record the quantity in the distributor as indicated by use of the calibrated measuring stick and as indicated by the tank gauge.
- Indicate whether or not the tank gauge was adjusted or reset to equal the stick reading.
- Check and record the spray bar height at the right and left ends of the bar.

- Indicate whether or not the distributor is of the type that self-adjusts for load difference.

### GALLONS PER MINUTE TEST

- Set the asphalt pump tachometer or gallons per minute meter to 100 gal. /min.
- Record the gallons of oil indicated by the stick measurement in the pre-test warmup as the "beginning gallons".
- On que, pump oil from the source of supply to the distributor for six minutes. Six minutes is the recommended duration of the test, you may elect to use an alternate duration.
- At the end of the timed pump, record both the stick measurement and tank gauge readings as the "gallons ending".
- Calculate and record the "total gallons pumped" by subtracting the "gallons beginning" from the stick measured "gallons ending".
- Record the actual minutes of the "test duration".
- Calculate and record the "gallons per minute" by dividing the "total gallons pumped" by the "test duration" time.
- Indicate whether or not the tank gauge was adjusted to equal the stick measurement.
- Check and record the spray bar height at the right and left ends of the bar.
- This concludes the Gallons Per Minute Test with the asphalt pump tachometer set at 100 gallons per minute. To further verify the resultant yield in "gallons per minute", it will be necessary to repeat this process with the asphalt pump tachometer set at 125 gallons per minute, and again at 150 gallons per minute. The "gallons beginning" for each subsequent test will equal the stick measured "gallons ending" of the previous test.
- If the calculated "gallons per minute" deviates more than five (5) gallons from the asphalt pump tachometer setting, this information should be reported to the garage manager.

### GROUND SPEED TEST

- Set the bitumeter or foot per minute meter to 300 ft. per minute.
- Accelerate to 300 ft. per minute and once up to this speed, dispense a one second shot of oil on que.
- Traveling at a constant speed of 300 ft. per minute, dispense another one second shot of oil after exactly one minute of time has lapsed

from the first shot of oil.

- Measure and record the distance from the beginning of the first shot of oil to the beginning of the second shot of oil.
- Record the difference between the measured distance and the bitumeter setting . . . differences greater than ten (10) feet should be reported to the garage manager.
- This concludes Ground Speed Test with the bitumeter set at 300 feet per minute. To further verify the results, it will be necessary to repeat this process with the bitumeter set at 350, 400 and 450 feet per minute.

#### TRIPLE LAP COVERAGE TEST

- Record the quantity, type and temperature of the oil on board at time of the test.
- Set the pump for five (5) gallons per minute for each foot of bar.
- With the exception of nozzles on the last three feet of the spray bar, all remaining nozzles should be plugged such that only every third nozzle is firing . . . nozzles on the last three feet of the bar should remain open for pressure relief.
- After making a short shot(s) to warm the bar & nozzles, review the spray pattern...the tips of each fan of spray must touch. Streaking indicates that the spray bar is too low and overlapped spray fans indicate that the spray bar is too high.
- Record the height of the spray bar at which the correct spray pattern was achieved. Although only one entry is required, it is important to understand that spray bar height must be the same across the length of the bar.

#### CHIPPER

##### CALIBRATION/DOCUMENTATION

Chipper calibration consists of two basic elements. 1) Identifying and relating ground speed (expressed in feet traveled per minute) to a specific gear and range and 2) Determining the yield (expressed in pounds per square yard) of a given gradation and type of aggregate when traveling at a predetermined ground speed at various gate opening settings.

The calibration document, located in Appendix B, on page 7-18, is provided to document results of the chipper calibration process and may be copied for field use.

- Hook a dump truck to the chipper and load

the hopper with aggregate.

- With the throttle completely open and the truck attached, select a gear and range at which the equipment is normally operated.
- Proceed forward. When the machine is up to speed, open the gates on que for a period of two seconds. At the end of one minute open the gates again for another two seconds.
- Measure the distance traveled from the beginning of the first drop to the beginning of the second drop. This is the forward speed expressed in feet per minute.
- Record the Gear and Range (Hi or Low) at which the drop was made. You may also wish to record the RPM's.

Employing this method, find a gear and range which yields a forward speed in feet per minute that will approximate the actual speed of the chipping operation... usually between 300 and 400 feet per minute. Remember, the forward speed must be coordinated between the chipper and distributor. Because the speed of the chipper cannot be changed easily, the speed of the operation will be governed by the forward speed of the chipper.

- Record the Gear and Range (Hi or Low) at which the desired speed or "ft/min" was achieved. Record the measured "ft/min". You may also wish to record the RPM.
- Load a dump truck with aggregate from a source and of a type intended for use in the seal coat and liquid bituminous surface treatment program. Record the vendor and the aggregate type.
- Place a one square yard frame on a drop cloth approximately 30 yards in front of the chipper.
- Attach the dump truck to the chipper and fill the hopper with the selected aggregate.
- Select a gate setting at which the chipper has been operated historically with the subject aggregate. Record this setting.
- With the truck attached, bring the chipper up to speed in the identified gear and range, and open the gates on approach to the drop cloth depositing aggregate over the one square yard frame.
- Clean all stone outside the one square yard frame from the drop cloth and pick up and weigh the balance. Record the weight of the stone, this is the yield in pounds per square yard.

This procedure should be repeated through a

range of gate settings. The number of tests completed will depend largely on the number and range of design application rates for the subject aggregate. In addition to calibrating the chipper for each type of aggregate intended for use, consideration should also be given to calibrating the chipper for like types of aggregate from each vendor. This is particularly important in those areas serviced by vendors producing both limestone and gravel products.

**DISTRIBUTOR CALIBRATION DOCUMENT**

Date: \_\_\_\_\_

County: \_\_\_\_\_

Equipment #: \_\_\_\_\_

Calibrated By: \_\_\_\_\_

Verified By \_\_\_\_\_  
Equipment Manager

Oil Type and Temperature: \_\_\_\_\_

**GALLONS PER MINUTE TEST**

1) Pre-test Warm-up

Post Warm-up Measurement

(A) Pump Appx. 200 Gallons

Stick Tank Gauge

Into Distributor From Supply \_\_\_\_\_ (Unadjusted Reading)

(B) Tank Gauge Reset to Stick Measurement ..... Yes \_\_\_\_\_ No \_\_\_\_\_

(C) Spray Bar Height ..... Right \_\_\_\_\_ Left \_\_\_\_\_

(D) Distributor Self Adjusting for Load Difference . . . Yes \_\_\_\_\_ No \_\_\_\_\_

100 GAL./MIN. 125 GAL./MIN. 150 GAL./MIN.

2) Gallons Per Minute Test

DURATION-6 MIN. DURATION-4 MIN. DURATION-3 MIN.

(A) Gallons Beginning

(B) Gallons Ending  
(Stick Measurement)

(C) Gallons Ending  
(Unadjusted Tank Gauge Reading)

(D) Total Gallons Pumped (2B-2A)

(E) Test Duration-Actual

(F) Gallons Per Minute (2D/2E)

(G) Tank Gauge Adj. to Stick Measurement Yes No Yes No Yes No (H) Spray Bar Height

Rt. Lt. Rt. Lt.

REMARKS: \_\_\_\_\_

**GROUND SPEED TEST**

BITUMETER SETTING

FEET/MINUTE MEASURED DISTANCE

REMARKS

300 \_\_\_\_\_

350 \_\_\_\_\_

DIFFERENCE

400 \_\_\_\_\_

450 \_\_\_\_\_

**TRIPLE LAP COVERAGE TEST**

1) Gallons of oil on board at time of test. \_\_\_\_\_ /Oil Type \_\_\_\_\_ Oil Temp. \_\_\_\_\_

2) Height of bar at which triple lap coverage was achieved. \_\_\_\_\_



**APPENDIX C****DEPARTMENT RESPONSIBILITY  
BEYOND CURBLINES**

The Department's policy with regard to legal responsibility for maintenance beyond curblines is as follows:

**POLICY****A. Highways in First-Class Cities**

Department of Transportation may not perform any maintenance beyond the face of curb (except that the P.U.C. may order such maintenance on bridges under its jurisdiction), unless, with respect to Act 615 highways only, it has entered into an agreement assuming such maintenance.

**B. County Highways Taken over by Act 615 of 1961**

Department of Transportation may not perform any maintenance (1) beyond portions available to vehicular traffic or (2) upon guiderail and drainage facilities, unless it has entered into an agreement assuming such maintenance.

**C. Highways in Boroughs, Incorporated Towns and Cities Other than First Class**

Department of Transportation will not perform any maintenance beyond curblines except as required to maintain the structural integrity of the highway, such as slopes, walls, etc., unless, with respect to Act 615 highways only, Department has entered into an agreement assuming such maintenance.

Where some properties are curbed and others are not, the curblines can be projected on the uncurbed properties.

If there are no existing curblines, the Secretary can indicate on a plan of public record the width of the street or highway the Department will maintain.

**D. State Routes that had the Old Five-Digit L.R. Numbers in Townships**

Department of Transportation may per-

form maintenance beyond curblines. Where the Department has not assumed responsibility to perform such maintenance, townships may do so.

**E. State Routes that had the Old One, Two, Three, or Four-Digit L.R. Numbers in Townships**

Department of Transportation will perform maintenance beyond curblines.

**APPENDIX D**

**DAILY REPORTING FORM (SEAL COATS AND SURFACE TREATMENTS)**

District \_\_\_\_\_ County \_\_\_\_\_ Foreman \_\_\_\_\_ Date \_\_\_\_\_  
 S.R. \_\_\_\_\_ Seg. \_\_\_\_\_ Offset \_\_\_\_\_ Seg. \_\_\_\_\_ Offset \_\_\_\_\_  
 Seal Coat \_\_\_\_\_ Double Seal Coat \_\_\_\_\_ Surface Treatment \_\_\_\_\_  
 Surface Preparation Was: Good \_\_\_\_\_ Fair \_\_\_\_\_ None \_\_\_\_\_  
 Surface Preparation Included: Scratch \_\_\_\_\_ - Leveling \_\_\_\_\_  
 Base Repair \_\_\_\_\_ Potholes Patches \_\_\_\_\_  
 Scratch Material Type \_\_\_\_\_ lb/Yd2 \_\_\_\_\_ Date Scratch Placed \_\_\_\_\_ By Who \_\_\_\_\_  
 Leveling Material Type \_\_\_\_\_ lb/Yd2 \_\_\_\_\_ Date Level Placed \_\_\_\_\_ By Who \_\_\_\_\_  
 Source of Scratch \_\_\_\_\_ Source of Leveling \_\_\_\_\_  
 Temperature of the: Air \_\_\_\_\_ Aggregate \_\_\_\_\_ Surface \_\_\_\_\_ Bituminous Material \_\_\_\_\_

**BITUMINOUS MATERIAL**

1st Lift	2nd Lift
E-2 E-3 Other _____	E-2 E-3 Other _____
Source _____	Source _____
Location _____	Location _____
Distribution Calibrated: Yes _____ No _____	Distribution Calibrated: Yes _____ No _____
Application Rate: Design _____ SY	Application Rate: Design _____ SY
Actual _____ SY	Actual _____ SY
Application Rate Checked	Application Rate Checked
BY _____ Method	BY _____ Method

**AGGREGATE**

1st Lift	2nd Lift
Source Code _____ PA.# _____ (Bulletin 14)	Source Code _____ PA.# _____ (Bulletin 14)
Chip Spreader Calibrated: Yes _____ No _____	Chip Spreader Calibrated: Yes _____ No _____
Stone _____ Gravel _____ Slag _____	Stone _____ Gravel _____ Slag _____
Wet _____ Damp _____ Dry _____ NA _____	Wet _____ Damp _____ Dry _____ NA _____
Washed: Yes _____ No _____	Washed: Yes _____ No _____
Precoated: Yes _____ No _____	Precoated: Yes _____ No _____
Precoated with: 55-lh, CSS-lh, PG 64-22	Precoated with 55-lh, CSS-lh, PG 64-22
Precoat Source _____	Precoat Source _____
Precoat Location _____	Precoat Location _____
Application Rate Design _____ SY	Application Rate Design _____ SY
Of Aggregate: Actual _____ SY	Of Aggregate: Actual _____ SY
Aggregate Application Rate Checked	Aggregate Application Rate Checked
BY _____ Method	BY _____ Method

**ROLLERS**

No. of Rollers \_\_\_\_\_ Rubber Tire \_\_\_\_\_ Steel Wheel \_\_\_\_\_  
 Rollers Did \_\_\_\_\_ Did Not \_\_\_\_\_ Backroll \_\_\_\_\_

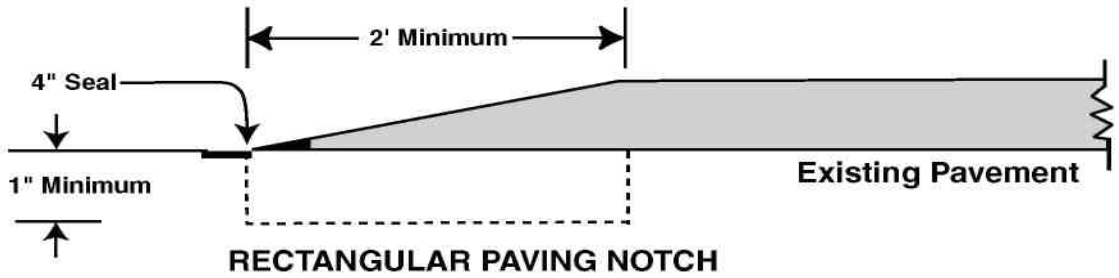
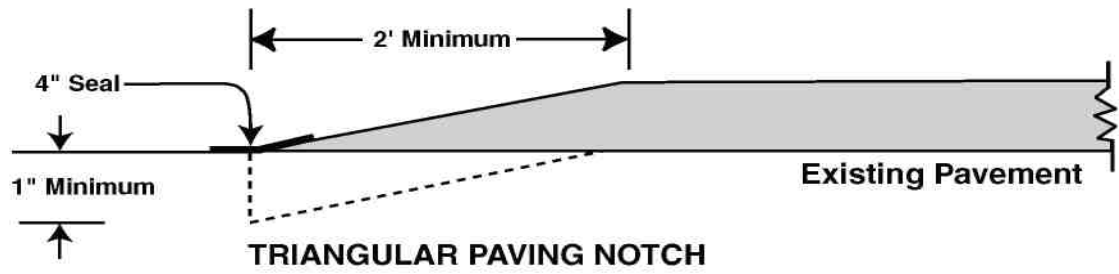
**TRAFFIC CONTROL**

Primary Method of Traffic Control: Detour \_\_\_\_\_ Pilot Car \_\_\_\_\_ Flagman \_\_\_\_\_  
 Fresh Surface Protected From Traffic For \_\_\_\_\_ Hours After Rolling  
 ADT \_\_\_\_\_ Of Roadway SIGNATURE \_\_\_\_\_

ADDITIONAL COMMENTS SHOULD BE ADDRESSED ON THE REVERSE SIDE

APPENDIX E

PAVED SURFACES DIAGRAM



## FOREMANS MANUAL

711-7136-01	Pavement Widening BCBC – Mechanical	Tons	B
711-7136-02	Pavement Widening, Cement Concrete	SqYd	A
711-7137-01	Pavement Widening Recycled Material – Mechanical	Tons	B
711-7141-01	Concrete Patching - Full Depth	SqYd	A
711-7141-02	Concrete Patching - Spalls	SqYd	A
711-7147-01	Joint Sealing Concrete Roads	Lane Miles	6
711-7147-02	Joint Sealing Concrete Rds. - Pavement/Shoulders Separation	Lane Miles	6
711-7148-01	Stockpile Aggregate	Man-hrs	7
711-7151-01	Minor Risk Management/Safety	Sites	9

### Shoulders - Unpaved and Side Approaches

711-7212-01	Grading – Mechanical	Miles	8
711-7213-01	Stabilization - Add Material – Mechanical	Miles	8
711-7213-09	Stabilization - Pre Hauling	O Miles	8
711-7214-01	Dust Palliative Bituminous or Calcium Chloride	SqYd	A
711-7215-01	Cutting - Belt Loader	Miles	8
711-7215-02	Cutting - Front End Loader	Miles	8
711-7216-01	Upgrading - Paving Mechanized	Tons	B
711-7217-01	Stabilization - Add Material – Manual	Feet	4


### Shoulders - Paved and Side Approaches

711-7221-01	Patching – Manual	Tons	B
711-7222-01	Patching - Mechanical - Plant Mix	Tons	B
711-7222-02	Surface Treatment - Plant Mix	Tons	B
711-7224-01	Surface Treatment - Mechanical - Liquid Bituminous	Gallons	5
711-7224-09	Surface Treatment - Liquid Bituminous - Pre Hauling	O Gallons	5
711-7225-01	Driveway Adjustment	Feet	4
711-7226-01	Base/Subbase Repair - Light Duty	Tons	B
711-7226-02	Base/Subbase Repair - Heavy Duty	Tons	B
711-7227-01	Skin Patching - Manual - Liquid Bituminous	Gallons	5
711-7227-02	Skin Patching - Mechanical - Liquid Bituminous	Gallons	5
711-7227-03	Skin Patching - Mech. - Liq. Bit. - Distr. And Spray Wand	Gallons	5
711-7227-09	Skin Patching - Pre Hauling	O Gallons	5
711-7228-01	Crack Sealing	Lane Miles	6
711-7232-01	Milling	SqYd	A
711-7233-01	Recycling	SqYd	A

### Drainage Cleaning, Repair or Replacement

711-7311-01	Cleaning - Inlet/Endwall/Basin - Manual/Mechanical	Each	H
711-7311-02	Cleaning - Inlet – Clogged	Each	H
711-7312-01	Cleaning - Ditch/Drain Chan. – Mech.	Feet	4
711-7312-02	Cleaning - Ditch/Drain Chan. – Manual	Feet	4

**FOREMANS MANUAL**

<p><b>M-200L (10-99)</b></p> 	<p><b>BUREAU OF MAINTENANCE AND OPERATIONS PERFORMANCE STANDARD</b></p>	<p><b>ACTIVITY NUMBER</b> 711-7125-01</p>
<p><b>ACTIVITY</b> ROAD-PAVED HOT PLANT MIX - 1" MECHANIZED PAVER FINISHER - PAVING</p>		<p><b>EFFECTIVE DATE</b> January 31, 2008</p>
<p><b>ACTIVITY DESCRIPTION SUMMARY</b></p>		<p><b>PERFORMANCE STANDARD</b></p>
<p>This activity includes all actions related to the application of a uniform, one inch, bituminous paving operation by Department Force or Contract such as sweeping, application of tack coat, cutting pavement notches, placing of hot mix with bituminous Paver Finisher and compaction on paved roads in excess of 500 feet continuous length. Paved lengths of 500 feet or less shall be charged to activity code 711-7122.</p> <p>Prior to application of hot bituminous plant mix, all surface defects must be carefully studied and repaired in accordance with the Maintenance Manual, Publication 23, Chapter 7. Roadway preparation work such as pothole patching, skin patching, crack sealing, base repair, etc. shall be charged to the appropriate activity code for the function being performed. Mechanized application of bituminous material to re-establish the cross section <u>prior</u> to the application of a full width, uniform lift application of bituminous material shall be charged to activity code 711-7131. Particular attention should be given to removing wheel ruts of 1/2 inch or greater with a Leveling Course.</p> <p>Paving with FJ or Superpave material shall be limited to the time period of April 1 through October 31 according with Pub 408 Section 409.3(b); and the ambient temperature shall be 50° F and rising.</p>		<p>None Established</p>

# FOREMANS MANUAL

## ACTIVITY REQUIREMENTS

MEN		EQUIPMENT		MATERIAL	
NUMBER	CLASSIFICATION	NUMBER	TYPE	AMOUNT	DESCRIPTION
1	Foreman	1	Crew Cab	As Req'd	Bituminous Material
5	Equipment Opers		Hand Tools		
4	Crew Members	1	Paver	As Req'd	Tack Coat
7	Equip. Opers. (Haul)	2	Steel Wheel/Vibratory Roller		
3	Crew Members (Safety)	1	Water Tank Truck		
		1	Pull Broom		
		1	Tack Coat Applicator or Distributor		
		1	Compressor And Breaker		
		7	Dump Trucks		

**\* Note: 7 equipment operators and dump trucks are eliminated if contract hauling is used.**

PRODUCTION UNIT	PROD.UNITS/HOURS	PLANNING UNITS
Tons Code B	N.E.	N.E.

### Method and Procedure

The Work Zone Traffic Control set up shall be erected in accordance with Pub. 213 or Pub. 54. This activity is typically a short term slow moving operation.

A training package including video, slides and work booklet has been prepared for this activity. All personnel should review training materials prior to start of work.

Prior to beginning of work, the foreman will give the required safety talk and provide general instructions to the work crew on the day's activities.

Potholes and severe depressions shall be patched prior to mechanized paving.

The roadway must be clean of all litter, debris, leaves, loose stones, mud, etc.

Notches must be cut at the limits of the paving and intersecting roadways per the Maintenance Manual, Publication #23, Chapter 7, Paving Notch.

## FOREMANS MANUAL

Tack coat is uniformly applied by a distributor at a rate of .05-.15 gallons per square yard which yields a residual rate of approximately .02-.07 gallons per square yard. The .05 gallon per square yard application rate should be utilized on flushed/bleeding surfaces while heavier application rate of .15 gallon per square yard should be utilized on dry pavement surfaces. Refer to the Maintenance Manual, Chapter 7, Tack Coat for additional tack coating details.

This operation becomes a standard paver/finisher application. Trucks loaded with material back into the paver hopper, then are pushed along by the paver as material is applied to the road surface.

Crew Members check paving quality and repair surface mat, as necessary, using hand tools.

A three wheel roller compacts surface mat, followed by intermediate rolling with a pneumatic tire roller, with finish rolling by a tandem roller. A vibratory tandem roller may be used in lieu of a pneumatic tire roller for intermediate rolling. Roller operators are expected to operate water truck and fill their rollers as required. (Superpave compaction requirements may vary)


Adjustments to manholes, catch basins and similar structures must be made to match the new finish grade. Municipalities should be contacted in advance and adjustments to their facilities coordinated with the paving operations.

Crews should attempt to pull abutting lanes even by the end of the day in accordance with Specification 408, Section 409.3(K).

The use of temporary pavement markings may be required and should be charged to this cost function.

This work shall be approved by the District Executive and be scheduled on the M-213 program.

# FOREMANS MANUAL

<p><b>M-200L (10-99)</b></p> 	<p align="center"><b>BUREAU OF MAINTENANCE AND OPERATIONS PERFORMANCE STANDARD</b></p>	<p><b>ACTIVITY NUMBER</b> 711-7131-01</p>
<p><b>EFFECTIVE DATE</b> January 31, 2008</p>		
<p><b>ACTIVITY</b></p> <p>ROAD-PAVED LEVELING COURSE - HOT PLANT MIX MECHANIZED - TOW OR FINISHER PAVER</p>	<p><b>PERFORMANCE STANDARD</b></p> <p>2.77 tons/man hr.</p>	
<p><b>ACTIVITY DESCRIPTION SUMMARY</b></p> <p>This activity includes all actions related to applying a Leveling Course to re-establish the roadway cross section using a Paver Finisher or Tow Paver in excess of 500' continuous length.</p> <p>The hot plant mix bituminous material may be either FB, FJ, or Superpave selected and applied in accordance with Chapter 7 of the Maintenance Manual.</p> <p>An additional application of hot plant mix or bituminous seal coat normally follows the application of the Leveling course.</p> <p>This work must be scheduled on the M-213 program.</p> <p>The Work Zone Traffic Control set up shall be erected in accordance with Pub. 213 . This activity is typically a short-term, slow moving operaiton.</p> <p>A training package including video, slides and work booklet has been prepared for this activity. All personnel should review training materials prior to start of work.</p>		

**ACTIVITY REQUIREMENTS**

MEN		EQUIPMENT		MATERIAL	
NUMBER	CLASSIFICATION	NUMBER	TYPE	AMOUNT	DESCRIPTION
1	Foreman	1	Crew Cab	As	Hot Plant Mix
2-4	Equipment Operators	1	Paver	Req'd	Tack Coat
3-4	Equip. Opers. (Haul)	1	Broom		
2	Crew Members	2	Steel		
	(Safety)		Wheel/Vibratory		
2	Crew Members (Labor)	1	Roller(s)		
		1	Distributor		
		1	Water Tank Truck		
		3-4	Dump Trucks		
		1	Compressor and		
			Breaker or		
			Mechanical		
			Milling Head		

PRODUCTION UNIT	PROD.UNITS/HOURS	PLANNING UNITS
Tons Code B	35 Tons/Hr.	250 Tons/Day

**Method and Procedure**

Prior to the beginning of work, the foreman will give the required safety talk and provide general instructions to the work crew on the days' activities.

The Assistant Manager and Foreman shall insure that enough trucks for hauling plant mix are available to permit a continual operation.

The roadway must be clean of all debris, dirt, etc.

All preparation work must be completed prior to the placement of the Leveling course.

Uniformly apply approved tack coat over entire area at the rate of .05-.15 gal./sq.yd. Order tack coat pre-mixed at a 50:50 ratio to yield a residual rate after application of approximately .02-.07 gal./sq.yd. The .05 gal./sq.yd. application rate should be utilized on flushed/bleeding surfaces while the heavier application rate of .15 gal./sq.yd. should be utilized on dry surfaces. Refer to Maintenance Manual, Chapter 7, Tack Coat for additional details.

## FOREMANS MANUAL


This operation becomes standard tow paver or paver finisher application with trucks loaded with material being attached to the tow paver or backing into a paver finisher, then pulling the tow paver or being pushed by the paver finisher as material is applied to the road surface. Material is applied to the thickness required to restore the proper cross section of the road.

As required, Crew Members check paving quality and repair surface material as necessary using hand tools.

Compact the material using sufficient rollers in accordance with Specification 408, Section 409.3(i). Includes tandem, pneumatic tire and three wheel roller. Vibratory tandem may be substituted for pneumatic tire roller. (Superpave compaction requirements may vary.)

The use of temporary pavement markers may be required and should be charged to this cost function.

**FOREMANS MANUAL**

<b>M-200L (10-99)</b> 	<b>BUREAU OF MAINTENANCE AND OPERATIONS PERFORMANCE STANDARD</b>	<b>ACTIVITY NUMBER</b> 711-7136-01
		<b>EFFECTIVE DATE</b> January 31, 2008
<b>ACTIVITY</b>  ROADWAY PAVEMENT WIDENING WITH SUPERPAVE BASE COURSE	<b>PERFORMANCE STANDARD</b>  None Established	
<b>ACTIVITY DESCRIPTION SUMMARY</b>  This activity includes all actions related to the widening of paved roadways such as scarifying, shaping, and/or removing existing material, the addition of Superpave Base Course, shaping and compacting.  The areas to be widened shall be confined to C, D & E system roadways, shall be programmed on the M-213 program, and shall be approved by the District Executive.  The widening shall consist of a minimum of 2 feet. If both sides of the roadway are to be widened, it shall consist of a minimum of 2 feet on each side.  Refer to Maintenance Manual, Chapter 7, Widening.  The Work Zone Traffic Control set up shall be erected in accordance with Pub. 213.  Environmental concerns such as wetlands, erosion control and waterway pollution are to be addressed in the disposal of excavated materials. Refer to Maintenance Manual, Pub. #23, Chapter 3, Erosion and Sedimentation Control.  Waste materials shall not be placed in wetlands or waterways. Waste materials must be stabilized. Rolling is acceptable stabilization.		

**ACTIVITY REQUIREMENTS**

<b>MEN</b>		<b>EQUIPMENT</b>		<b>MATERIAL</b>	
<b>NUMBER</b>	<b>CLASSIFICATION</b>	<b>NUMBER</b>	<b>TYPE</b>	<b>AMOUNT</b>	<b>DESCRIPTION</b>
	Varies According to Job Requirements				

## FOREMANS MANUAL

PRODUCTION UNIT	PROD.UNITS/HOURS	PLANNING UNITS
Tons Code B	N.E.	N.E.

### Method and Procedure


Varies according to Job Requirements.

Prior to the beginning of work, the foreman will give the required safety talk and provide general instructions to the work crew on the days' activities.

The depth of the widened pavement shall match the depth of the existing pavement.

The existing pavement edges shall be properly cleaned and a tack coat applied in accordance with specification 408, Section 409.3(g) prior to placement of Superpave Base Course.

Straw bales, silt fence or rock filters are to be installed-at low point of the project during operations if any unstabilized area remains overnight. Unstabilized is defined as an excavated area that has not been filled in with aggregate and/or asphalt material. These measures must be taken so as to receive all runoff from the bare, disturbed area.

<b>M-200L (10-99)</b> 	<b>BUREAU OF MAINTENANCE AND OPERATIONS PERFORMANCE STANDARD</b>	<b>ACTIVITY NUMBER</b> 711-7136-02
		<b>EFFECTIVE DATE</b> January 31, 2008
<b>ACTIVITY</b> ROADWAY PAVEMENT WIDENING WITH CEMENT CONCRETE	<b>PERFORMANCE STANDARD</b> None Established	
<b>ACTIVITY DESCRIPTION SUMMARY</b>  This activity includes all actions related to the widening of paved roadways such as scarifying, shaping, and/or removing existing material and, the addition of Cement Concrete.  The areas to be widened shall be confined to C, D & E system roadways, shall be programmed on the M-213 program, and shall be approved by the District Executive.  The widening shall consist of a minimum of 2 feet. If both sides of the roadway are to be widened, it shall consist of a minimum of 2 feet on each side.  Refer to Maintenance Manual, Chapter 7, Widening.  The Work Zone Traffic Control set up shall be erected in accordance with Pub. 213.  Environmental concerns such as wetlands, erosion control and waterway pollution are to be addressed in the disposal of excavated materials. Refer to Maintenance Manual, Pub. #23, Chapter 3, Erosion and Sedimentation Control.  Waste materials shall not be placed in wetlands or waterways. Waste materials must be stabilized. Rolling is acceptable stabilization.		

**ACTIVITY REQUIREMENTS**

MEN		EQUIPMENT		MATERIAL	
NUMBER	CLASSIFICATION	NUMBER	TYPE	AMOUNT	DESCRIPTION
	Varies According to Job Requirements				

PRODUCTION UNIT	PROD.UNITS/HOURS	PLANNING UNITS
SqYd Code A	N.E.	N.E.

# FOREMANS MANUAL

## Method and Procedure

Varies according to Job Requirements.

Prior to the beginning of work, the foreman will give the required safety talk and provide general instructions to the work crew on the days' activities.

The depth of the widened pavement shall match the depth of the existing pavement.

Transverse joints on the widening or lane addition shall be aligned with those on the original pavement. Joint spacing shall follow these spacings or some factor of these spacings:

Plain Concrete:

Pavements <10 in. thick - use 15 ft. joint spacing

Pavements >10 in. thick - use 20 ft. joint spacing


Reinforced Concrete:

All pavement - use 30 ft. joint spacing

Lane additions and widening should be tied to the existing pavement.

Straw bales, silt fence or rock filters are to be installed-at low point of the project during operations if any unstabilized area remains overnight. Unstabilized is defined as an excavated area that has not been filled in with aggregate and/or asphalt material. These measures must be taken so as to receive all runoff from the bare, disturbed area.

**FOREMANS MANUAL**

<p><b>M-200L (10-99)</b></p> 	<p><b>BUREAU OF MAINTENANCE AND OPERATIONS PERFORMANCE STANDARD</b></p>	<p><b>ACTIVITY NUMBER</b></p> <p>711-7137-01</p>
<p><b>ACTIVITY</b></p> <p>ROADWAY - PAVEMENT WIDENING WITH RECYCLED MATERIAL</p>		<p><b>EFFECTIVE DATE</b></p> <p>January 31, 2008</p>
<p><b>ACTIVITY DESCRIPTION SUMMARY</b></p>		<p><b>PERFORMANCE STANDARD</b></p> <p>None Established</p>
<p>This activity includes all actions related to the widening of paved roadways such as scarifying, shaping, and/or removing existing material, the addition of recycled material, shaping and compacting.</p> <p>Aggregate Bituminous Base Course (ABBC) may be used in lieu of recycled material with approval of the District Executive.</p> <p>The areas to be widened shall be confined to C, D &amp; E System roadways, shall be programmed on the M-213 program, and shall be approved by the District Executive.</p> <p>The existing paved roadway width shall be 18 feet or less and the widening shall consist of a minimum of 2 feet. Refer to Maintenance Manual, Chapter 7, Widening.</p> <p>If both sides of the roadway are to be widened, it shall consist of a minimum of 2 feet on each side.</p> <p>The Work Zone Traffic Control set up shall be erected in accordance with Pub. 213.</p> <p>Environmental concerns such as wetlands, erosion control and waterway pollution are to be addressed in the disposal of excavated materials. Refer to Maintenance Manual, Chapter 3, Erosion and Sedimentation Control.</p> <p>Waste materials shall not be placed in wetlands or waterways. Waste materials must be stabilized.</p> <p>Rolling is acceptable stabilization.</p>		

# FOREMANS MANUAL

## ACTIVITY REQUIREMENTS

MEN		EQUIPMENT		MATERIAL	
NUMBER	CLASSIFICATION	NUMBER	TYPE	AMOUNT	DESCRIPTION
	To Be Established				

PRODUCTION UNIT	PROD.UNITS/HOURS	PLANNING UNITS
Tons		
Code B	N.E.	N.E.

### Method and Procedure

Varies According to Job Requirements.

Prior to the beginning of work, the foreman will give the required safety talk and provide general instructions to the work crew on the days' activities.

The depth of the widened pavement shall match the depth of the existing pavement. If the compacted depth of the widened pavement is greater than 6", construct in two or more layers of approximately equal depth with no layer less than 3" nor more than 6" in depth. The widened area shall be sealed during the same construction season.

The existing pavement edges shall be properly cleaned and a tack coat applied in accordance with Specification 408, Section 409.3(g) prior to placement of the recycled material.

Straw bales, silt fence or rock filters are to be installed at the low point of the project during operations if any unstabilized area remains over night. Unstabilized is defined as an excavated area that has not been filled in with aggregate and/or asphalt material. These measures must be taken so as to receive all runoff from the bare, disturbed area.